Referee Report:
The Geometry of Cosmological Correlators

In this paper, the authors provide a polytopic interpretation for the cosmological correlator. In section 1 they have provided an introduction to the subject and a very useful summary of Results. In section 2 they explain how the model of self-interacting conformally coupled scalars is a good toy model as fields with higher masses can be obtained by acting with differential operators on this model. They also provide a way to obtain cosmological correlators from the wave function by a certain operation. Finally, they also describe a novel integral representation allowing them to construct loop-level integrands for Witten diagrams from the tree-level Witten diagrams. In section 3 they review the construction of arxiv:1709.02813 which describes the construction of the cosmological polytope for the wave function of the universe. In section 4 they build on the previous sections to give a polytopic interpretation for the cosmological correlator and also provide additional mathematical structures.

Overall this paper is clearly written and is accessible to experts and non-experts. It builds new tools for studying a problem that is both conceptually and technically interesting and should be published in SciPost.

However, I would urge the authors to kindly clarify the following points and perhaps add a couple of footnotes if they feel so with regard to these before publishing.

1. Could the authors expand on how the "dashing-prescription" in section 2.5 is working? In particular, how does it take care of various symmetry factors that could arise depending on the interaction term?

2. Is there any issue in using the tree theorem to derive higher loop integrands?

3. Is there any physical interpretation for the variable $z_{ss'}$ in equation 4.54?

4. Is there any physical reason to expect the factorization given in equation 4.94? There are certain factorization properties described in a previous paper by one of the authors – 1709.02813 – but is it clear why and how these would directly extend to the cosmological correlator? Are these related to any OPE like properties at the boundary?